Detectors for Synchrotron Research

National Workshop held Oct 30/31, 2000
in Washington, D.C.

Sponsored by DOE Office of Science

Introduction

- What is purpose of workshop?
- Why have workshop?
- Who is on program committee?
- How will it succeed?
- What is the workshop format?
- What is the agenda of the workshop?
- What is format of workshop output?
- How will we get everything done?

Al Thompson (LBNL)

Purpose of Workshop

To produce a collective vision of how to develop the next generation of detectors required for forefront scientific investigations using synchrotron radiation.

To create a "Roadmap for Synchrotron Detector Development"

Why is Detector Roadmap Needed?

- There is an increasing mismatch between capabilities of synchrotron radiation beamlines and detectors.
- Revolutionary detector technology is becoming available using microelectronics tools.
- Increasing sophistication of experiments is driving the need for more sophisticated detectors.
- Complexity of detectors is outgrowing development by small groups – more coordinated approach required.

Program Committee Has Members From All U.S. Synchrotrons

Aladdin - Ralf Wehlitz

ALS - Al Thompson

APS - Denny Mills

CAMD - Josef Hormes

CHESS - Sol Gruner

NSLS - Peter Siddons

SSRL - John Arthur

Other members - Steve Naday (ANL)
Franco Manfredi (Univ. of Pavia)

To Succeed We Must Develop the "Case" for a Roadmap

- Must show that we have polled the synchrotron community for their detector needs.
- Must show that new detectors would have a significant impact on *specific* scientific programs.
- Must show that proposed research program has realistic goals and that it is closely coupled to experimental needs.
- Must show that the research program is focused and cost effective.
- Must publicize results to the synchrotron community.

Workshop Format

- First Day
  - experimental needs in different science fields
  - possible detector improvements
  - reports from synchrotron representatives
  - formation of working groups
- Second day
  - working groups develop research plan
  - discuss roadmap and workshop summary
- Proceedings of workshop will be published in Journal of Synchrotron Radiation. Papers are peer reviewed which will give credibility to the conclusions.
  (cf. recent NAS review of Astronomy needs for 10 years)

Agenda Starts With Scientific Needs for Better Detectors

- Spectroscopy and Atomic Structure- Chuck Fadley
- Diffraction Techniques - Sean Brennan (SSRL)
- X-Ray Microscopy - Mark Rivers (Chicago)
- EXAFS - Steve Heald (PNCC Cat at APS)
- Ultra-Fast Dynamics - Roger Falcone (UCB)
- Science Using Fourth Generation Machines - John Arthur (SSRL)
- Infrared Research - Larry Carr (NSLS)
- Macromolecular Crystallography - Bob Sweet (BNL)
- X-ray Scattering and Fluorescence - Chi Chang Kao (NSLS)

Agenda Continues With Detector Research Areas

- Overview of detector research areas - Rob Lewis (Daresbury)
- Gas detectors - Graham Smith (BNL)
- High energy resolution superconducting bolometer arrays - Kent Irwin - (NIST)
- CCD Detectors for Crystallography - Steve Naday (APS)

Special Session on Pixel Detectors

- Analog systems - Sol Gruner (CHESS)
- Digital systems - Christian Bronnimann (Swiss Light Source)
- Integrated systems - Jacques Millaud (LBNL)
- High Energy/Synchrotron Perspective - Eric Heijne (CERN)

More Detector Technologies

- Multi-element Si(Li), Ge and CdZnTe detectors for EXAFS
  - Gareth Derbyshire
- Silicon drift detectors - Pavel Rehak (BNL)
- Avalanche photo diodes - Alfred Baron (Spring 8)
- Photoelectron and UV detectors - Ralf Menk (ELETTRA)
- Sub-picosecond streak cameras - Jean-Claude Kiefferr (INRS Univ Quebec)

Second Day Will Be Busy

- Morning
  - working groups meet and hear short presentations from attendee's
  - discussion of recommendations
  - writing assignments

- Afternoon
  - working groups finalize writing
  - all meet together to hear working group output
  - discuss roadmap and workshop summary

What is the Format of the Workshop Report?

- Report will be published in a special issue of Journal of Synchrotron Radiation (peer reviewed).
- First section will be executive summary (written by program committee and working group leaders).
- Second section will be papers from science talks.
- Third section will be papers from detector talks.
- Fourth section will be working group output.

How Will We Get Everything Done?

- Speakers must keep within time limits!
- Questions/comments are encouraged but answers need to be short. Extended discussion at coffee, lunch, ...
- Input from all attendees is encouraged in working groups - we will include contributions in the final report.
- Contributions in roadmap discussion need to be succinct.